Innovation and Creativity in Organizations

Innovation and Creativity in Organizations:
A State-of-the-Science Review, Prospective Commentary, and Guiding Framework

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ABSTRACT

Creativity and innovation in any organization are vital to its successful performance. The authors review the rapidly growing body of research in this area with particular attention to the period 2002 to 2013, inclusive. Conceiving of both creativity and innovation as being integral parts of essentially the same process, we propose a new, integrative definition. We note that research into creativity has typically examined the stage of idea generation, whereas innovation studies have commonly also included the latter phase of idea implementation. The authors discuss several seminal theories of creativity and innovation, then apply a comprehensive levels-of-analysis framework to review extant research into individual, team, organizational, and multi-level innovation. Key measurement characteristics of the reviewed studies are then noted. In conclusion, we propose a guiding framework for future research comprising eleven major themes and sixty specific questions for future studies.

INNOVATION AND CREATIVITY IN ORGANIZATIONS: A STATE-OF-THE-SCIENCE REVIEW, PROSPECTIVE COMMENTARY, AND GUIDING FRAMEWORK

Innovation and creativity in the workplace have become increasingly important determinants of organizational performance, success, and longer-term survival. As organizations seek to harness the ideas and suggestions of their employees, it is axiomatic that the process of idea generation and implementation has become a source of distinct competitive advantage (Anderson, De Dreu, & Nijstad, 2004; West, 2002a; Zhou & Shalley, 2003). Yet, creativity and innovation are complex, multi-level, and emergent phenomena that pan out over time, and that require skillful leadership in order to maximize the benefits of new and improved ways of working. Considerable research has built up over the last 30 - 40 years at four specific approaches to levels-of-analysis – the individual, the work team, organizational, and multi-level approaches – across several disciplines within the management sciences. The aim of the present review is to comprehensively integrate these findings, but especially those published over the last decade, and to present key directions for future research. There has been an exponential growth in the number of papers published on creativity and innovation generally, and specifically on workplace creativity and innovation over recent years. Figure 1 shows the growth trend whereas Table 1 summarizes the growth in international studies in top-tier management journals over the last decade (both are published electronically on the Journal of Management website at http://doiop.com/innocreat).

The remainder of the paper is organized as follows. In the next section we review popular definitions and typologies of creativity and innovation in the workplace. We propose an integrative definition to cover these diverse perspectives. Next, we review theoretical perspectives to workplace creativity and innovation, noting six prominent theories in the

literature. Following that, we review the extant research organizing this by our levels-of-analysis framework – studies at the individual, team and workgroup, organizational, and multiple levels-of-analysis are considered in turn. Afterwards, we present an overview of the methodological characteristics of these studies paying specific attention to the measurement of creativity and innovation. In the next section, we put forward a constructive critique of the existing research, and gaps in our understanding of these phenomena. Emerging from these issues, we propose eleven overarching directions for future research and then draw final conclusions from our integrative review.

TOWARD DEFINITIONAL CLARITY: CREATIVITY AND INNOVATION

We propose the following integrative definition:

Creativity and innovation at work are the process, outcomes, and products of attempts to develop and introduce new and improved ways of doing things. The creativity stage of this process refers to idea generation, and innovation to the subsequent stage of implementing ideas toward better procedures, practices, or products. Creativity and innovation can occur at the level of the individual, work team, organization, or at more than one of these levels combined, but will invariably result in identifiable benefits at one or more of these levels-of-analysis.

Whereas creativity has been conceived of as the generation of novel and useful ideas, innovation has generally been argued to be both the production of creative ideas as the first stage, and their implementation as the second stage (Amabile, 1996; Oldham & Cummings, 1996; Shalley & Zhou, 2008; West & Farr, 1990). Although various definitions have been proposed, there remains a lack of general agreement between researchers over what constitutes precisely either creativity or innovation with different studies using rather different operationalizations of each concept (West & Farr, 1990). More recent literature in the field suggests that the boundaries between both concepts are not that clear. On one hand, some

scholars have advocated a stronger conceptual differentiation between creativity and innovation (e.g., Oldham & Cummings, 1996; Rank, Pace, & Frese, 2004). Yet, on the other hand, other authors have argued that creativity occurs not only in the early stages of innovation processes, but rather they suggest a cyclical, recursive process of idea generation and implementation (e.g., Paulus, 2002). There is indeed some empirical support for this suggestion with several studies showing that the innovation process as it unfolds over time is messy, reiterative, and often involves two steps forwards for one step backwards plus several side-steps (King, 1992; Van de Ven, Angle, & Poole, 1989). It has further been argued that creativity is concerned with absolute, "true" novelty, whereas innovation also involves ideas that are relatively novel – ideas that have been adopted and adapted from other organizations but that are new to the unit of adoption (Anderson et al., 2004). We would note that ideas can be reliably assessed on a continuum in terms of novelty and radicalness, and similarly that innovation may also include absolutely novel and radical ideas as well as ideas that are less novel and more incremental (Zaltman, Duncan, & Holbek, 1973). Furthermore, creativity has been argued to involve primarily intra-individual cognitive processes whereas innovation mainly represents inter-individual social processes in the workplace (Rank et al., 2004).

In essence, because creativity centers on idea generation and innovation emphasizes idea implementation, creativity is often seen as the first step of innovation (Amabile, 1996; Mumford & Gustafson, 1988; West, 2002a, 2002b). As far as innovation is concerned, new ideas and practices implemented in an organization may be generated by employees in the focal organization (Janssen, 2000). However, idea generation by employees in the focal organization is not a pre-requisite for innovation - the new ideas and practices may also be generated by employees outside of the focal organization (Zhou & Shalley, 2010). As long as an employee intentionally introduces and applies a new idea, method, or practice, he or she is said to engage in innovation (Anderson, et al., 2004; West & Farr, 1990). Hence, whereas

creativity and innovation are related constructs, they are by no means identical. A final point is that when examining innovation or idea implementation at the individual level-of-analysis, researchers have also used the terms role innovation (West & Farr, 1990) and innovative behavior (Yuan & Woodman, 2010). We therefore put forward the integrative definition given at the start of this section to address these various issues and to move the field forwards to some degree toward definitional clarity.

THEORETICAL PERSPECTIVES

Six influential theoretical perspectives and models can be discerned across the creativity and innovation literatures (see Table 3 online at http://doiop.com/innocreat).

Componential Theory of Organizational Creativity and Innovation

The most important premise of this theory is that work environments impact creativity by affecting components that contribute to creativity which represent a basic source for organizational innovation (Amabile, 1997). There are three major components contributing to individual or small team creativity: expertise, creative-thinking skill, and intrinsic motivation. In contrast, the main components of the wider work environment that influence employee creativity are organizational motivation to innovate, resources (including finances, time availability, and personnel resources), and managerial practices, such as enabling challenging work and supervisory encouragement (Amabile, 1997; Amabile & Conti, 1999). This model has received some empirical support in terms of the role of its motivation component as a psychological mechanism underlying influences from the work environment on employees' creativity, though the other components have not received as much research attention as the motivation component (Shalley, Zhou, & Oldham 2004; Zhou & Shalley, 2010).

Interactionist Perspective of Organizational Creativity

The interactionist perspective of organizational creativity (Woodman, Sawyer, & Griffin, 1993) stresses that creativity is a complex interaction between the individual and

their work situation at different levels of organization. At the individual level, individual creativity is the result of antecedent conditions (e.g., biographical variables), cognitive style and ability (e.g., divergent thinking), personality (e.g., self-esteem), relevant knowledge, motivation, social influences (e.g., rewards), and contextual influences (e.g., physical environment). At the team level, creativity is a consequence of individual creative behavior, the interaction between the group members (e.g., group composition), group characteristics (e.g., norms, size), team processes, and contextual influences (e.g., organizational culture, reward systems). At the organizational level, innovation is a function of both individual and group creativity (Woodman et al., 1993). This has been one of the most frequently used conceptual frameworks in emphasizing the interactions between the contextual and individual factors that might enhance or inhibit creativity at work (Shalley, Gilson, & Blum, 2009; Yuan & Woodman, 2010; Zhou & Shalley, 2010).

Model of Individual Creative Action

Ford (1996) argued that employees have to consider between two competing options- to be creative or to undertake merely routine, habitual actions. According to this framework, there are three groups of factors that might influence this decision: sense-making processes, motivation, and knowledge and skills. Individual creative action is thus argued to be a result of the joint influence of these factors, in the case any of them being lacking, an individual would not engage in creative action. The motivation to initiate a creative or habitual action is further determined by goals, receptivity beliefs (e.g., expectations that creativity is valued – creative actions are rewarded), capability beliefs (e.g., expectations that one is capable of being creative or confident in creative ability), and emotions (e.g., interest and anger as facilitators of creativity whereas anxiety constraints creativity). Although this model has not attracted as much research attention as the componential or interactionist frameworks have, perhaps partly because the model is complex and hence it may be challenging to empirically

test it as a whole, portions of it have received some empirical support over more recent years (e.g., Janssen, 2005; Unsworth & Clegg, 2010).

Theorizing on Cultural Differences and Creativity

The question of whether there are differences in creativity in different cultures has significant implications for management practice, international business and economic development (Morris & Leung, 2010; Zhou & Su, 2010). However, theorizing and research in this regard have lagged behind practical needs. This significant research-practice gap has led to repeated calls for greater research attention on cultural differences and creativity (Anderson et al., 2004; Shalley et al., 2004; Zhou & Shalley, 2003), especially on similarities and differences in creativity between the East and the West (Morris & Leung, 2010).

Regarding individuals' creativity, theorizing has focused on cultural differences in individual creativity, such as how task and social contexts moderate the relation between individuals' cultural values (e.g., individualism/collectivism, power distance, and uncertainty avoidance) and creativity (Erez & Nouri, 2010), how culture moderates influences of leaders, supervisors, coworkers, and social networks on creativity (Zhou & Su, 2010), how culture influences the assessment of creativity (Hempel & Sue-Chan, 2010), and how culture affects the entire process of creativity (Chiu & Kwan, 2010).

Regarding team creativity, Zhou's (2006) model of paternalistic organizational control derives from international research into cultural differences between work teams in Western and Eastern countries. It is interesting in regard of this point-of-departure as it conceptualizes how different forms of paternalistic control at the organizational level of analysis may impinge upon creativity produced by teams embedded in the organizations. In this model, paternalistic organizational control is theorized as the level of control exerted by top management over personnel and task-related decisions within work teams. Zhou (2006) suggests that the impact of such control on team intrinsic motivation and consequently, on

team creativity, differs in terms of national culture. She suggests that paternalistic organizational control fosters team intrinsic motivation and creativity for teams in the East, whereas for teams in the West, such organizational control acts as an inhibitor of group intrinsic motivation and thus creativity. This is one of the first models published in the mainstream organizational science literature that takes a multi-level approach to directly address the role of national culture as it may influence how organizational control at the organizational level of analysis affects team creativity at the team level of analysis. Even so, empirical examination of it has been rare, perhaps partly because its multi-level theorizing requires that researchers collect data from a large number of teams embedded in a good number of organizations in Eastern and Western countries. On the other hand, conceptual works positing positive impact of teams' cultural diversity on team creativity have received more research attention and empirical support (Stahl, Maznevski, Voigt, & Jonsen, 2009). Consistent with the "value-in-diversity" thesis in the diversity literature, this line of work essentially argues that cultural diversity promotes divergence in teams, and divergence leads to creativity (Stahl et al., 2009).

While the above works largely focus on creativity, the next two focus on innovation.

Four Factor Theory of Team Climate for Innovation

West (1990) posits four team climate factors facilitative of innovation: vision, participative safety, task orientation and support for innovation. Innovation is enhanced if (1) vision is understandable, valued and accepted by the team members, (2) team members perceive they can propose new ideas and solutions without being judged or criticized, (3) there is a stimulating debate and discussion of different possible solutions within the team which at the same time will more likely be carefully examined, and finally (4) team members perceive support for innovation (Anderson & West, 1998; West, 1990). This theory has been

widely applied in the team innovation research and has received support from both primary and more recently from meta-analytic studies (Hülsheger, Anderson, & Salgado, 2009).

Ambidexterity Theory

Bledow, Frese, Anderson, Erez, and Farr (2009a, 2009b) recently advocated ambidexterity theory to explain the process of managing conflicting demands at multiple organizational levels to successfully innovate. Ambidexterity refers to "the ability of a complex and adaptive system to manage and meet conflicting demands by engaging in fundamentally different activities" (Bledow et al., 2009a: 320). Generally ambidexterity represents successful management of both, exploration (e.g., creating new products) and exploitation (e.g., production and implementation of products). In terms of integration of activities, Bledow et al. (2009a) distinguish between active management on one hand and self-regulatory processes on the other and suggest that both are required for the integration of activities performed by sub-systems or at different points in time (Bledow et al., 2009b). Some support has already been published for the major precepts of ambidexterity theory (Rosing, Frese, & Bausch, 2011), and this perspective therefore holds potential for future studies most notably into leadership effects in innovation processes.

Summary

The reviewed theoretical backgrounds are major frameworks in the field of creativity and innovation in the workplace. Some have received more empirical support than others, but they all emphasize the role of different determinants of either idea generation or the implementation of ideas. Perhaps the major omission of these frameworks is that each one of them mainly centers either on the first step (i.e., idea generation) or on the second step of the innovation process (i.e., idea implementation). Furthermore, although different levels-of-analysis are considered in each framework, some put more emphasis on the team level (e.g., the input-process-output model), while others are more concerned with the individual level

(e.g., model of individual creative action). Future efforts toward theorizing should hence aim to develop more integrative frameworks which could encourage more bold multi-level designs to explore factors implicated in both creativity and innovation across multiple levels of analyses. We propose more specific suggestions to develop innovative theoretical perspectives in the penultimate section of this paper. Having noted these perspectives, we next turn to consider specific advances in the body of research over the period covered in this narrative review.

RESEARCH REVIEW

Levels of Analysis Framework

We organize studies by four levels-of-analysis: individual, team, organizational, and multi-level. A major summary of the extant research organized by each level, then sub-categorized by key variables reported in past studies to have an effect upon creativity or innovation in the workplace is presented in Table 4, again online at http://doiop.com/innocreat.

Individual Level-of-Analysis

Studies at the individual level can be summarized under four headings: *individual factors, task contexts,* and *social contexts* with further sub-categorizations under each heading.

Individual Factors. This section includes studies examining effects of individual differences such as traits, values, thinking styles, self-concepts and identity, knowledge, and abilities, and psychological states on creativity.

Traits. Though only a small number of studies have investigated Big Five personality dimensions and creativity, results from these studies are interesting, suggesting that these Big Five dimensions interact with contextual factors to enhance or restrict creativity. For example, Raja and Johns (2010) examined how each of the Big Five dimensions (i.e.,

conscientiousness, openness to experience, agreeableness, extraversion, and neuroticism) interacted with job scope to affect creativity. Job scope was a composite score of five core job characteristics: skill variety, task identity, task significance, autonomy, and feedback (Hackman & Oldham, 1980). Results showed a complex pattern of relations: when job scope was high, (a) neuroticism and extraversion each had a negative relation with creativity; (b) interactions between conscientiousness or agreeableness and job scope were not significant but openness to experience positively related to creativity when job scope was low rather than high. Other studies have focused on one or two personality dimensions and sought to identify contextual variables that were particularly relevant to them (e.g., Baer, 2010; Baer & Oldham, 2006; George & Zhou, 2001; Madjar, 2008).

Taken together, these results suggest that the relation between personality and creativity is complex, which is shaped by contextual variables. They also suggest the necessity to focus on one personality dimension at a time in order to identify contextual variables that are particularly relevant for the relation between a particular personality dimension and creativity. Madjar, Oldham, and Pratt (2002) investigated how creative personality traits were related to creativity. These studies are noteworthy because they showed under what contextual conditions employees with fewer creative personality traits exhibited greater creativity, thereby providing initial evidence that managers can in fact nurture and promote creativity in employees who are not naturally predisposed to be creative. Gong, Cheung, Wang, and Huang (2012) examined how proactive personality was related to creativity. Few studies have been conducted to focus on an understanding of effects of general or specific personality dimensions on innovative behavior or implementation of creative ideas.

Goal orientations. Individuals may also have different goal orientations (i.e., self-development beliefs which serve as motivational mechanism that influences how employees

interpret and act in achievement situations; Elliot & Church, 1997). A learning goal orientation emphasizes personal development of competence, whereas a performance orientation focuses on showing competence to external observers. Hirst, Van Knippenberg, and Zhou (2009a) found that learning orientation had a positive main effect on creativity. This main effect result was replicated by Gong et al. (2009). Mastery orientation bears conceptual similarity to learning orientation. It refers to the belief that one's capabilities and competences are changeable, and hence, investing greater effort will enhance one's competence and task mastery (e.g., Dweck, 1999). Janssen and Van Yperen (2004) found a positive relation between mastery orientation and innovative behavior. However, their innovative behavior measure included both idea generation and implementation. Hence, it is not clear whether mastery orientation positively related to idea generation (which would be consistent with Hirst et al., 2009a and Gong et al., 2009), or to idea implementation, or to both. Relatedly, Shalley et al. (2009) found a positive main effect of growth need strength (i.e., individual differences in their desire to seek personal growth while working on their jobs; Hackman & Oldham, 1980) on creativity.

Values. Values are guiding principles of individuals' lives; they provide directions for action, and they serve as standards for judging and justifying action. Hence, employees' values may be relevant for idea generation and implementation. Shin and Zhou (2003) found that employees high on conservation value reacted more strongly and positively to the influence of transformational leadership by exhibiting greater creativity. Zhou, Shin, Brass, Choi, and Zhang (2009) integrated a social network perspective that emphasizes how structural properties of an employee's social network (e.g., number of weak ties) influence the employee's creativity, and an individual agency perspective that emphasizes how an employee's characteristics (e.g., values) shape employee creativity. They found that employees' *conformity value* moderated the curvilinear relation between number of weak ties

and creativity in such a way that employees were more creative at intermediate levels of number of weak ties and when they held low conformity values. Congruence of values on individual responses to innovation was addressed in Choi and Price (2005). They examined relative effects of value-fit and ability-fit on commitment to implementation (i.e., implementing a new work process at the focal company) and implementation behavior. Results were rather mixed, failing to paint a clear picture of how different measures of these two types of fit differentially affect commitment to implementation and implementation behavior. Because values are guiding principles in employees' lives and affect their goals and actions, it is valuable to systematically examine the role of values in employees' idea generation and implementation.

Thinking styles. Individuals who have high *need for cognition* enjoy thinking and cognitive activities. Wu, Parker, and De Jong (in press) found that when autonomy was low, need for cognition had a stronger, positive relation with innovative behavior; when time pressure was low, it had a stronger, positive relation with innovative behavior. It may be necessary to take a fine-tuned look at whether need for cognition is particularly relevant for idea generation or idea implementation. Clegg, Unsworth, Epitropaki, and Parker (2002) reported that intuitive thinking style was positively, but systematic thinking style was not, related to idea suggestion. Both thinking styles were negatively related to idea implementation. These differential patterns of correlation are consistent with our view that creativity (idea generation) and innovative behavior (idea implementation) need to be clearly defined and operationalized, and they may have different antecedents. Recently, Miron-Spektor et al. (2011) showed having members with creative and conformist cognitive styles benefited, but having members with attention-to-detail cognitive styles stifled, teams' radical innovation, suggesting some cognitive styles may facilitate idea generation, whereas others may inhibit it, and still others may facilitate idea implementation.

Self-concepts and identity. Rank, Nelson, Allen, and Xu (2009) found that for employees with low organization-based self-esteem, the more their supervisors exhibited transformational leadership, the greater the employees' innovative behavior. It is not clear whether the interactive effects between self-esteem and transformational leadership affect idea generation, idea implementation, or both. A few studies examined creativity-specific self-concepts or identities such as creative self-efficacy (Tierney & Farmer, 2002), creative role identity (Farmer, Tierney, & Kung-McIntyre, 2003), and creative personal identity (Jaussi, Randel, & Dionne, 2007). For example, Tierney and Farmer (2002) define creative self-efficacy as employees' self-view concerning the extent to which they are capable of being creative. Tierney and Farmer (2011) examined creative self-efficacy development and creativity over time. Results showed that when creative self-efficacy increased, so did creativity, and increases in employees' creative role identify and perceived creative expectation from supervisors related positively to increases in creative self-efficacy. Finally, individuals may have multiple identities. For example, Asian-Americans may have dual identities—being Asian and being American. Recent research showed that high levels of identity integration (e.g., Asian-Americans who feel comfortable negotiating between their dual identities and experience compatibility between them) benefited creativity (Cheng, Sanchez-Burks, & Lee, 2008; Mok & Morris, 2010).

Knowledge and abilities. Knowledge is a key component for creativity (Amabile, 1996). But empirical studies on how knowledge affects employee creativity and innovation in the workplace have been rare. One exception was Howell and Boies (2004), who found that strategic and relational knowledge was positively related to idea promotion. Choi, Anderson, and Veillette (2009) examined interactions between employees' creative abilities and contextual variables. Results suggest that creative ability had an insulating effect in such a way that when creative ability was low, there was a negative relation between unsupportive

climate and creativity; on the other hand, when creative ability was high, creativity remained at about the same level regardless of the level of unsupportive climate. Baer (2012) showed that creativity and implementation had the strongest, negative relation when employees' networking ability and perceived implementation instrumentality were low.

Psychological states. More progress has been made in understanding how psychological factors affect creativity than idea implementation. Several studies focused on effects of affect, mood states, or job dissatisfaction on creativity (Amabile, Barsade, Mueller, & Staw, 2005; Binnewies & Wörnlein, 2011; Fong, 2006; George & Zhou, 2002, 2007; Zhou & George, 2001). Results are mixed: Amabile et al. (2005) reported that *positive affect* led to creativity, whereas George and Zhou (2002) found that under the condition of high rewards and recognition for creativity and clarity of feelings, *negative affect* actually had a positive relation with creativity. Fong (2006) found that neither positive nor negative emotion had any main effects on creativity; instead, *emotional ambivalence* (the simultaneous experiences of positive and negative emotions) facilitated creativity. Consistent with their "dual-tuning" theorizing that positive mood enhances cognitive flexibility and negative mood sustains effort, George and Zhou (2007) showed that employees exhibited the greatest creativity when both *positive and negative mood* were high, and when supervisors built a supportive context by providing developmental feedback, being trustworthy, or providing interactional justice. Using creative work involvement as the dependent variable, Carmeli and colleagues found that *feelings of energy* and *vitality* were related to creative work involvement (Atwater & Carmeli, 2009; Kark & Carmeli, 2009). More work is needed to clarify whether positive affect, negative affect, or both are particularly conducive to creativity and innovation. Future work may find results reported by Baas, De Dreu, and Nijstad (2008) informative, because they suggest the need to differentiate activating vs. deactivating mood states within the broad categorization of positive vs. negative moods.

Motivation. Intrinsic motivation has been theorized to be a key ingredient for creativity (Amabile, 1996). With a few exceptions such as Shin and Zhou (2003) and Zhang and Bartol (2010a), research devoted to testing it as a psychological mechanism that explains effects of task and social contexts, and their interactions with individual differences on creativity is still sparse. Additionally, research showed the positive relation between intrinsic motivation and creativity was stronger when prosocial motivation was higher (Grant & Berry, 2011).

Researchers have also begun to investigate motivational antecedents of innovative behavior. Yuan and Woodman (2010) found that *expected positive performance outcomes* positively, and *expected image risks* negatively, related to innovative behavior. However, unexpectedly, expected image gains were also negatively related to creativity.

Other factors. A few studies looked at effects of *strain* and *trust* on creativity and innovative behavior. Van Dyne, Jehn, and Cummings (2002) found a negative relation between strain and creativity. Clegg et al. (2002) found when trusting they would share benefits of creativity, employees made more suggestions, but this type of trust had little effect on idea implementation. On the other hand, when employees trusted that their organization would listen to them, they did better on idea implementation. Ng, Feldman, and Lam (2010) reported that *psychological contract breach* lowered innovative behaviors.

Task Contexts. Research has shown that the task and social contexts in which employees are embedded have a substantial influence on their creativity and innovative behavior either directly or via interacting with individual difference variables.

Job complexity. When a job (a) provides opportunities for the job holder to learn and use a variety of skills; (b) is identifiable; (c) has significant implications for others; and (d) provides autonomy and feedback, the job is said to have high levels of complexity (Hackman & Oldham, 1980). Job complexity (operationalized as the mean of the five core job

characteristics - skill variety, task significance, task identity, autonomy, and feedback) is a key aspect of the task contexts relevant for creativity (e.g., Farmer et al., 2003; Oldham & Cummings, 1996; Shalley et al., 2009; Tierney & Farmer, 2004).

Another feature of jobs is *routinization* (Perrow, 1970), but this should not be seen as the opposite of job complexity (Ohly, Sonnentag, & Pluntke, 2006). After repeated execution of a behavior, it may become routinized and further executing it may not require much intentionality and awareness, which could happen even to employees holding complex jobs. Ohly et al. (2006) found main effects of routinization on both creativity and idea implementation. Even so, one might argue that employees performing routine work may lose interest in coming up with creative ideas. Few studies have examined this possibility.

Goals and job requirements. Creativity goals are conducive to creativity (Shalley, 1991, 1995). Relatedly, job requirements have received increasing research attention and a few initial studies found it to relate positively to creativity (Shalley, 2008; Unsworth & Clegg, 2010; Unsworth, Wall, & Carter, 2005). Studies examining the impact of time pressure on creativity and innovation yielded mixed results: Ohly and Fritz (2010) found that daily time pressure was positively related to daily creativity, whereas Baer and Oldham (2006) found an inverted U-shaped relation between creative time pressure and creativity, when support for creativity and openness to experience were high.

Another task context factor is rewards. Zhou and Shalley (2003) stated that whether rewards facilitate or hinder creativity was one of the most important and yet unsolved puzzles in creativity research. Ten years later, the puzzle is still unsolved but researchers have made progress in revealing a complex relation (Baer, Oldham, & Cummings, 2003; Eisenberger & Aselage, 2009; George & Zhou, 2002). For example, Baer et al. (2003) found that reward was positively related to creativity when employees had an adaptive cognitive style and worked

on jobs with low levels of complexity. We echo Zhou and Shalley's (2003) call for more research on effects of rewards on creativity and innovative behavior.

Social Contexts. Different aspects of social context have been explored in creativity and innovative behavior at the individual level.

Leadership and supervision. Leadership and supervision are essential influences on creativity (see Tierney, 2008 for a comprehensive review). Studies have yielded mixed results: while some researchers found that *transformational leadership* positively related to creativity (Bono & Judge, 2003, Study 2; Gong et al., 2009; Shin & Zhou, 2003), others found that transformational leadership positively, whereas *transactional leadership* negatively, related to innovative behavior only when followers' psychological empowerment was high (Pieterse, Knippenberg, Schippers, & Stam, 2010). One other study found a positive moderating, but not main, effect of a facet of transformational leadership -inspirational motivation on the relation between employees' team identification and creativity (Hirst, Van Dick, and Van Knippenberg, 2009b).

Other studies looked at impact of specific supervisory behaviors such as *supervisory support* (Madjar et al., 2002), *supervisory expectations for creativity* (Carmeli & Schaubroeck, 2007; Tierney & Farmer, 2004), *supervisory empowerment behaviors* (Zhang & Bartol, 2010a), *supervisory developmental feedback* and *non-close monitoring* (Zhou, 2003), supervisory *benevolence* (Wang & Cheng, 2010), and *abusive supervision* (Liu, Liao, & Loi, 2012) on creativity. Some research has also examined supervisory support (Janssen, 2005) and *influenced-based leadership* on innovative behavior (Krause, 2004). Similar to the inclusive results involving transformational leadership and creativity, results from studies focusing on specific supervisory behaviors are also far from conclusive, either because only one or two studies on a specific supervisory behavior—creativity/innovation relation have been conducted, or because empirical results across studies were not consistent. Hence, more

research on leadership and supervision needs to be done (as we argue subsequently in this review).

Customer influences. Madjar and Ortiz-Walters (2008) found that customer input, and customer affect-based trust had direct and positive impact on service-related creativity.

Other social influences: feedback, evaluation, and justice. Although feedback has been shown to have significant and yet complex influences on creativity, few studies have directly examined the mechanisms through which such influences occur. One exception is Yuan and Zhou (2008) who found that expected external evaluation hindered generating a large number of ideas; however, individuals who did not expect external evaluation at the variation stage at which they are told to generate as many ideas as possible, but did have such expectation at the selective retention stage at which they are told to select and refine ideas so that the ideas are truly new and useful, generated the most creative ideas. In addition, employees do not have to be passive recipient of feedback; instead, they can actively engage in feedback seeking in order to regulate their behavior. Integrating the feedback seeking and creativity literatures, De Stobbeleir, Ashford, and Buyens (2011) found that feedback inquiry had a direct, positive relation with creativity.

Distributive, procedural, interpersonal and informational justices are important contextual variables in predicting employee attitudes and behavior. In recent years, efforts to understand the impact of various types of justice on creativity have been made, but direct and positive relations between any of these four types of justice and creativity have proven to be elusive (Khazanchi & Masterson, 2011). Finally, research on effects of supervisor, coworker, and customer influences on employees' creativity may benefit from integration with other social and task variables documented in the creativity literature, such as feedback, evaluation, and justice. For example, research may compare and contrast effects of feedback provided by supervisors versus coworkers on different stages of the creativity-innovation process.

Social Networks. How employees' positions in their social networks affect their creativity and innovative behavior has attracted increasing research attention (Baer, 2010; Obstfeld, 2005; Perry-Smith, 2006; Perry-Smith & Shalley, 2003; Zhou et al., 2009). One noteworthy feature of this small but growing body of work is its focus on the joint effects of structural properties of one's network and the individual's characteristics such as personality and values. As such, these studies contributed to both creativity and social networks literatures in that they emphasize the joint effects of network properties and individual agency in shaping employees' behavior at work.

Other Research. A few interesting studies could not be classified into our framework at the individual level. Alge, Ballinger, Tangirala, and Oakley (2006) examined effects of *information privacy* – the extent to which employees perceive that they have control over how their personal information is collected, stored, and used by their organization – on creativity. They found that information privacy was positively related to creativity via psychological empowerment. Madjar, Greenberg, and Chen (2011) found that *willingness to take risks*, *career commitment*, and *resources for creativity* were associated with radical creativity, *presence of creative coworkers* and *organizational identification* were associated with incremental creativity, and *conformity* (the tendency to conform to norms and not willing to be different from others) and organizational identification were related to routine, non-creative performance. Zhang and Bartol (2010b) demonstrated an inverted U-shaped relation between creative process engagement and overall job performance (a moderate level of creative engagement facilitated overall job performance). Finally, Janssen (2003) showed that when employee *job involvement* was high, innovative behavior was positively related to conflict with coworkers and negatively related to satisfaction with coworkers, highlighting the potential costs of innovative behavior.

Summary. The above narrative review suggests that (a) both dependent variables—creativity (idea generation) and innovation (idea implementation) — warrant more in-depth future research; (b) it may not be productive to focus upon attempting to uncover main effects of traits on creativity. Instead, in-depth future research needs to investigate how context activates or suppresses the manifestation of traits in relation to creativity and innovation; (c) affective, cognitive, and motivational psychological states related to creativity and innovation need greater research attention; (d) researchers have only identified a limited set of individual differences and contextual factors for creativity. Future research is needed to identify the full-range of individual differences and contextual factors for both creativity and innovation; and (e) research on cultural patterns of creativity is sparse.

Team Level-of-Analysis

Notable advances have also been made at the team level-of-analysis over recent years (see also Table 4 at http://doiop.com/innocreat). Highlighting these developments, two theoretically-driven meta-analytical integrations have been published at this level (Hülsheger, et al., 2009; Rosing, et al., 2011). They also hint at the maturation of the team-level research over the last decade or so. Although there remain far larger literatures at the individual and organizational levels-of-analysis, research into work group or work-team creativity and innovation is particularly valuable as organizations have moved inexorably to more team-based structures and will often be reliant upon teams to develop and implement innovative solutions even where the ideas may have originally been proposed by an individual (e.g., R&D teams: see also, Somech, 2006). Cutting through the aptly described "jungle of inconsistent findings" (West & Farr, 1989: 7), these meta-analytical findings have moved research at this level onwards, and have countered earlier suppositions over the relative importance of different variables in work group innovativeness and can be grouped under *team structure and composition, team climate and processes,* and *leadership style.*

Team Structure and Composition. Hülsheger et al. (2009) found that structural and composition issues were less impactful than had previously been presupposed. They meta-analyzed over 30 years of team-level primary studies and included over one hundred independent samples covering a diverse range of team variables. Facets of team climate (see below) exhibited higher mean corrected correlations (rho's) with innovativeness than did facets of either team structure or composition. Whereas team climate facets correlated at up to .49 (mean overall corrected rho) with innovativeness, team structure and composition correlated far less strongly. Facets of structure (job-relevant diversity, member background diversity, task and goal interdependence, team size and longevity) correlated at between -.13 (for member diversity) and .27 (goal interdependence), and in several cases these rho's were non-significant and non-generalizable. Of course, it could be that some of these structural and compositional variables influence team climate, and that climate in turn went on to affect innovativeness.

Other recent findings report effects for both *task* and *goal interdependence* (either directly or as moderators) upon team innovativeness, but at moderate levels of influence (e.g., Gilson & Shalley, 2004; Wong, Tjosvold, & Liu, 2009). Results likewise confirm that team *heterogeneity/diversity* is a problematic variable with regard to innovativeness – with either unclear findings, findings in either direction, and findings suggesting effects at different phases in team innovation (Shin & Zhou, 2007; Somech, 2006; Van der Vegt & Janssen, 2003). These findings reaffirm earlier research suggesting that greater diversity does not necessarily lead to greater team innovativeness, but may instead lead to reductions in team cohesiveness and in turn lower implementation capabilities (Anderson & King, 1991).

Team Climate and Processes. Stronger and less nuanced effects have been reported regarding team climate and processes for innovation. Using West's (1990) four factor theory, Hülsheger and her colleagues reported corrected mean correlations with team innovation of

.49, .15, .47, and .41 for *team vision, participative safety, support for innovation, and task orientation,* respectively. Further, they found rho's of .31 for team cohesion, .36 for internal communication processes, and .47 for external communication. The authors conclude that these findings not only give credence to earlier propositions regarding the importance of social processes and relationships to team-level innovation (e.g., Perry-Smith & Shalley, 2003), but also highlight the importance of team climate and group processes to effective innovativeness within work groups and teams (see also Choi, Sung, Lee, & Cho, 2011; Pirola-Merlo & Mann, 2004; and Zhang, Hempel, Han, & Tjosvold, 2007). Conflict within a team, however, was found to have lower levels of impact upon innovativeness. *Task conflict* correlated only .07 and *relationship conflict* marginally negatively at only -.09 with innovation, suggesting that team conflict may be either unrelated or related in a curvilinear manner to team innovativeness (Jehn, Rispens, & Thatcher, 2010).

Research that conceives of team climate and processes as antecedents far outweighs research that addresses processes in real-time either in organizational or experimental settings. Indeed, notably few studies have examined within-team innovation processes as they unfold over time. Since it is likely that different climatic variables influence innovation processes at different stages in the innovation process (Schippers, West, & Dawson, in press; Somech & Drach-Zahavy, 2013; Van de Ven, 1986; West & Richter, 2008), our expectation was for there to have been more studies into this important but largely unaddressed question.

Team Leadership. Many authors have understandably asserted that leadership style has directly attributable and likely strong, effects upon team innovativeness (e.g., Bledow et al., 2009a; George, 2007). Yet, fewer studies into these effects at the team level-of-analysis have been conducted than one might have expected. Despite this, the recent meta-analysis by Rosing and colleagues (2011) sheds valuable light upon this important question. As hypothesized, *transformational leadership* was found to correlate substantially more strongly

for the opening-up phase, whereas *transactional leadership* was generally found to be more effective for the later phase of idea implementation. Other primary studies and theoretical papers support this contention (Axtell, Holman, Unsworth, Wall, Waterson, & Harrington, 2000; Mumford, Scott, Gaddis, & Strange, 2002). Whether these leadership behaviors are variously termed *transformational* versus *transactional* (Wang & Rode, 2010) or *participative* versus *directive* (Amabile, Schatzel, Moneta, & Kramer, 2004; Somech, 2006), findings in this area unambiguously suggest, perhaps not surprisingly, that at the stage of idea generation transformational, participative leadership behaviors stimulate team innovation. Later on, as per ambidexterity theory, it is clear that more directive, transactional leadership behaviors are more effective as they move innovations toward implementation (Rosing, et al., op cit).

Summary. Team-level research has progressed significantly in the last decade. Published meta-analytic integrations now permit researchers to establish the importance of different group variables and processes to innovativeness, allowing future research to move away from these well-trodden questions and explore other important issues inherent in team innovation. Here, we envisage the most pressing issues to be those pertaining to team climate and leadership as facilitators of workgroup creativity and innovation. Having examined research at the team-level, we now turn to consider studies at the wider, organizational level-of-analysis.

Organizational Level-of-Analysis

Also at the organizational level-of-analysis, Table 4 serves as the organizing framework for our review comments (http://doiop.com/innocreat). These are structured under the headings *management-related factors, knowledge utilization and networks, structure and strategy, size, resources, culture and climate, external environment, innovation diffusion,* and lastly, *corporate entrepreneurship as innovation*.

Management-related Factors. Much of the research that has examined management-related factors in facilitating innovation has addressed the role of different *HR practices*. Results suggest that organizations that provide training and employee involvement practices, use performance-based pay systems, enable flexible working hours, emphasize job variety and autonomy, and those that are characterized by HR flexibility witness higher levels of innovation (e.g., Martínez-Sánchez, Vela-Jiménez, Pérez-Pérez & De-Luis-Carnicer, 2009, 2011; Shipton et al., 2006). However, while having temporary employees was found to facilitate innovation in some studies (Vogus & Welbourne, 2003), others reported just the opposite results (Martínez-Sánchez, Vela-Jiménez, Pérez-Pérez & De-Luis-Carnicer, 2011). Other studies have addressed the role of *management support* in organizational innovation in terms of CEO's *transactional and transformational leadership* (Jung, Chow, & Wu, 2003; Jung, Wu, & Chow, 2008), *management support* (Choi & Chang, 2009) and *top managers' favorable attitude towards innovation* (Damanpour & Schneider, 2006). Finally, previous research has also linked *top manager's demographic characteristics*, such as management or CEO tenure (Wu, Levitas, & Priem, 2005), managerial ownership (Latham & Braun, 2009), and racial and gender heterogeneity in management (Richard, Barnett, Dwyer, & Chadwick, 2004) to organizational innovation. Interestingly, whereas Damanpour and Schneider (2006) found a positive link between management tenure and innovation adoption, Wu et al. (2005) reported an inverted U-shaped relationship between CEO's tenure and organizational inventiveness.

Knowledge Utilization and Networks. Applied studies into how organizations use knowledge and knowledge networks explore the role of actors' social embeddedness in the creation, transfer, and adoption of knowledge (Figueiredo, 2011; Phelps, Heidl, & Wadhwa, 2012). Studies have addressed the role of different aspects of knowledge utilization and organizational learning in organizational innovation, such as *absorptive capacity*

(Lichtenthaler, 2009), *intellectual capital* (e.g., Rothaermel & Hess, 2007), *knowledge stock* (Kyriakopoulos & De Ruyter, 2004), *knowledge search* (e.g., Katila, 2002), and *social networks* (e.g., Phelps, 2010). The facilitative role of *knowledge spillover or transfer* in organizational innovativeness was meta-analytically confirmed (Van Wijk, Jansen, & Lyles, 2008). Kijkuit and Van den Ende (2010) found that strong ties between different units enhanced the adoption of ideas. In sum, previous research has addressed different aspects of social context, however the role of wider institutional context in knowledge creation and adoption still remains unclear (Phelps et al., 2012).

Structure and Strategy. Previous research has shown that *de-centralized* (Cohendet & Simon, 2007; Jung et al., 2008), *more complex* structures (Damanpour & Schneider, 2006), and structures with *harmonization* or commitment to low power differentiation (Shipton et al., 2006) and *low formalization* (Jung et al., 2008) facilitate innovation. Other studies examined the role of *micro institutional forces* (Vermeulen, Van den Bosch, & Volberda, 2007) such as *normative* (i.e., values and norms of the institution), *regulative* (i.e., established rules and procedures), and *cultural-cognitive forces* (i.e., shared systems of meaning between organizational members), *structural integration* (i.e., a choice to absorb or integrate the target firm into the acquirer losing its distinctive identity; Puranam, Singh, & Zollo, 2006), and *organization and innovation strategies* (e.g., He & Wong, 2004) in organizational innovation. Interesting findings come from Karim (2009) who found a U-shaped curvilinear relationship between *reorganization* (i.e., the creation, deletion, or recombination of business units within an organization) and innovation, implying that organizations need to experiment several events before positive outcomes, such as increased innovation, are observed.

Size. Camisón-Zornoza, Lapiedra-Alcamí, Segarra-Ciprés, and Boronat-Navarro (2004) in their meta-analysis report a small although significant mean correlation between size and innovation (rho = .15). Damanpour (2010) reported that around 60% of primary

studies found a positive relationship between size and both product and process innovation. Camisón-Zornoza et al. (2004) observed the strongest correlations between size measured in terms of *logarithmic number of employees* and *total sales*, respectively and innovation. The overall positive effect of size on innovations is not surprising – larger organizations are likely to have more assets of different classes (finances, personnel, expertise, etc.) to devote to innovation.

Resources. Studies have examined the role of *availability of resources* (Choi & Chang, 2009), *resource exchange* (e.g., Hargadon & Bechky, 2006), *resource diversity and quality* (Srivastava & Gnyawali, 2011), and *slack resources* (Greve, 2003) in organizational innovation. Contradictory findings were found regarding slack resources. Although this type of resources has been suggested and was found to enhance organizational innovation in some studies (e.g., Greve, 2003), Latham and Braun (2009) found that in declining organizations, managers with higher levels of ownership and more available slack spent significantly less on R&D investment. Moreover, Choi and Chang (2009) did not find a significant effect of *availability of resources* on innovation implementation process.

Culture and Climate. In common with studies at the team level, previous research has consistently found that a *climate supportive of innovation* is conducive of organizational-level innovation (Jung et al., 2008; Patterson, West, Shackleton, Dawson, Lawthom, Maitlis, Robinson, & Wallace, 2005). Unlike most of the existing studies on organizational innovation, Baer and Frese (2003) explored innovation as an antecedent of performance at the organizational level. They have found that the relationship between process innovativeness and firm performance was enhanced by high levels of *climate for personal initiative* and *psychological safety*.

Despite earlier calls for greater research attention (e.g., Janssen, Van de Vliert, & West, 2004), few studies have addressed the role of *national culture* in organizational

innovation. Elenkov and Manev (2005) found that dimensions of national culture moderated the relationships between top management leadership and organizational innovation. Wong, Tjosvold, and Su (2007) reported that *social face* (i.e., the individuals' attempts to show a desirable image to others and get an approval about their image - a cultural aspect particularly valued in collectivistic nations) enhanced innovation through both, task reflexivity and resource exchange. Surprisingly, Jung et al. (2003) found the *empowerment* to inhibit organizational innovation in their study conducted in Taiwan. They concluded that high power distance that characterizes Taiwanese culture could explain why employees in this type of cultures prefer more control by their top managers instead of having more autonomy about how to do their work.

External Environment. Research on organizational innovation has also examined different aspects of the wider environment in which organizations are embedded, such as *urbanization, community wealth, population growth,* and *unemployment rate* (Damanpour & Schneider, 2006), *competition* (Damanpour, 2010), *geographic distribution of R&D activity* (Lahiri, 2010), and *environmental uncertainty* (Wu et al., 2005). For instance, research has found that environmental *uncertainty* enhances organizational innovation (Jung et al., 2008; Martínez-Sánchez et al., 2011; Wu et al., 2005). Industry sector or market *competition* has been found to have both a direct positive effect (Damanpour, 2010) and a moderating effect on organizational innovation (e.g., Jung et al., 2008).

Innovation Diffusion. Research has mainly examined factors that enhance or inhibit diffusion processes. For instance, Ferlie, Fitzgerald, Wood, and Hawkins (2005) found that social boundaries in terms of strong professional roles and identities of health care professionals together with traditional work practices on one hand and cognitive boundaries in terms of different knowledge bases and research cultures on the other inhibited the diffusion of innovations in health care setting. Although some studies examined the role of

innovation adoption on organizational performance (e.g., Roberts & Amit, 2003), more research is needed to examine the effects of innovation diffusion on firms' outcomes.

Corporate Entrepreneurship as Organizational Innovation. Entrepreneurship refers to a cyclical process of value creation that starts off with human creativity, financial resources and technological capital which enhance new product development processes and new institutional forms leading to new ventures and successful innovations (Phan, Zhou, & Abrahamson, 2010). Innovation has been claimed to be an essential part in the new venture success (Baron & Tang, 2011). Research in the field of entrepreneurship has addressed, for instance, how entrepreneurs' characteristics predict organizational innovation (Baron & Tang, 2011; Zhou, 2008b). One recent study showed that positive affect perceived by the entrepreneurs predicted their creativity which in turn led to higher organizational innovation (Baron & Tang, 2011). There is also a fast growing, emerging literature examining the demand-side approach to entrepreneurship and technology innovation. This approach refers to research that "looks downstream from the focal firm, toward product markets and consumers, to explain and predict those managerial decisions that increase value creation within a value system" (Priem, Li, & Carr, 2012: 346). The value creation according to this approach is determined by consumers' willingness to pay. For instance, the demand-side research is looking at how customers are involved in innovation processes either as taking part in open sourcing or as product producers. The demand-side technological innovations are defined by Priem and colleagues (2012: 350) as "those innovations driven by the goals of either satisfying current consumer needs in an entirely new way or identifying and satisfying new needs". Another interesting theme in the demand-side research is user entrepreneurship which tries to explain how user or customer demands might lead to innovations which are eventually commercialized by the customers themselves (Priem et al., 2012).

Within the entrepreneurship literature, the concept of corporate entrepreneurship has emerged which has been defined as a sum of organizational innovation, renewal, and venturing efforts and characterized with innovativeness, risk-taking, and proactiveness (Sebora & Theerapatvong, 2010). Specifically, corporate entrepreneurship facilitates the introduction of changes and innovation in established organizations and hence, some scholars have suggested a considerable overlap between organizational innovation and corporate entrepreneurship (Lassen, Gertsen, & Riis, 2006). Previous research has addressed the role of *HR practices* (e.g., Kaya, 2006; Zhang & Jia, 2010), *decision comprehensiveness* (Heavey, Simsek, Roche, & Kelly, 2009), *transformational leadership* (Ling, Simsek, Lubatkin, & Veiga, 2008), *environmental perceptions* and *discretionary slack* (Simsek, Veiga, & Lubatkin, 2007), among others, in corporate entrepreneurship. Overlaps with our earlier review sections on these precise topics as they impact upon innovation are obvious. Readers interested in corporate entrepreneurship are encouraged to see Narayanan, Yang, and Zahra (2009) for a comprehensive review.

Summary. Our review shows a large number of studies that have been published in the last decade which clarify the role of diverse organizational and external environmental factors in organizational innovation. What we seem to be missing here, however, is a development of a more thorough and comprehensive conceptual explanation for the role of these factors in organizational innovation and a deeper understanding of how individual creative attempts translate into organizational innovation. We elaborate more on these issues in the directions for future research.

Multi-Level Research

Only a handful of studies have examined creativity and innovation processes from the multi-level perspective. Liu, Chen, and Yao (2011) investigated three-level data exploring the impact of *autonomy support* at the higher unit and team level and individual autonomy

orientation on individual job creativity. Their findings showed that harmonious passion fully mediated the effects of team autonomy support and team member autonomy orientation on individual creativity and partially mediated the effect of unit autonomy support on individual creativity. Daniels, Tregaskis, and Seaton (2007) looked at the relationships between individual *job control* and different health-related outcomes moderated by country-level R&D activity as proxy for innovation and controlling for sector-level variability, thus involving three levels of analysis – country, sector and individual. They found that national R&D activity moderated the relationships between individual levels of control and job dissatisfaction, perceived risk of occupational stress, and absence, respectively, such that these relationships were stronger where R&D activity was higher.

Team Structure and Individual Innovation. Van der Vegt and Janssen (2003) did not find any effects for *task and goal interdependence* on innovative behavior in homogenous teams, whereas in heterogeneous teams, task interdependence positively predicted innovative behavior in those individuals who perceived high levels of goal interdependence. Hirst, Van Knippenberg, Chen, and Sacramento (2011) found that *learning orientation* was positively related to individual creativity if there was low *centralization and formalization* within the team. Finally, Thatcher and Greer (2008) examined the role of *identity comprehension* as team-level variable (i.e., the extent to which the relative importance of one's identities is recognized by important others) in individual creativity and found a positive relationship between these two variables.

Team Climate and Individual Innovation. Pirola-Merlo and Mann (2004) found mixed support for *team climate* on individual creativity with only organizational encouragement of innovation and support for innovation as significant predictors. Hirst et al. (2009a) found a curvilinear relationship between *learning orientation* and creativity which was moderated by *team learning* behavior: at high levels of team learning behavior, the

positive relationship between learning orientation and creativity was stronger at moderate levels of learning orientation than at lower and higher levels. Most recently, Chen, Farh, Campbell-Bush, Wu, and Wu (2013) report important findings regarding cross-level effects between individual *proactive motivation*, *team innovation climate*, and *team motivation* in a sample of 95 R&D teams. The authors found that team innovation climate mediated between transformational leadership and team innovation, but also that individual motivational states mediated between proactive personality and individual-level innovation.

Leadership and team/individual Innovation. A few other multi-level studies have explored the role of *transformational leadership* and *LMX* on individual creativity. Shin, Kim, Lee, and Bian (2012) found that *cognitive team diversity* was significantly (and positively) related to individual creativity only when self-efficacy was high and cognitive team diversity was positively related to team member creativity only at high levels of team transformational leadership. Wang and Rode (2010) found that *transformational leadership* was most strongly related to individual creativity when high identification with the leader and high innovative climate were present. In contrast, Liao, Liu, and Loi (2010) examined the indirect effect of *LMX quality* on individual creativity via self-efficacy and proposed that this effect is moderated by LMX differentiation. Their results showed that LMX differentiation attenuated LMX quality's indirect effect on individual creativity. Gajendran and Joshi (2012) reported that LMX quality strengthened member influence on team decisions which in turn had a positive effect on team innovation.

Summary. We regard multi-level approaches as having particular promise to uncover and elucidate processes where innovation attempts cross different levels of analysis at some point in their progression, a common feature in many innovation attempts (see our earlier integrative definition). Moreover, such approaches are necessary to examine the role of both personal and situational factors in different performance outcomes (Wallace & Chen, 2006),

including creativity and innovation. We return to the issue of the need for greater research using cross-level and multi-level designs in the penultimate section of this paper. Next, we turn to the measurement of creativity and innovation at different levels of analysis.

MEASUREMENT ISSUES IN CREATIVITY AND INNOVATION RESEARCH

Table 5 (http://doiop.com/innocreat) summarizes measurement methods at different levels of analysis. Studies have most frequently measured creativity and innovation at the individual and team levels in terms of survey-based questionnaires, while at the organizational level, a considerable amount of studies used secondary objective data sources, such as Compustat, Eurostat or organizations' own archives. Creativity has most frequently been assessed by Zhou and George's (2001) instrument (12% of studies), followed by the measures of Oldham and Cummings (1996; 8% of studies) and Tierney, Farmer, and Graen (1999; 6% of studies). With regard to innovation, the instruments by Janssen (2001; 5% of studies), Burpitt and Bigoness (1997; 4% of studies), and Scott and Bruce (1994; 3% of studies) appear to have been used most frequently, although in the vast majority of studies the authors constructed their own research context-specific measures of innovation. A proportion of studies still rely upon self-ratings of either dependent and/or independent variables in innovation research. At the individual level this was around 24% of studies; at team level some 7%; and for multi-level studies, this was approximately 14%. Over the last decade there has been a concomitant increase in the use of independent or observer ratings, such as supervisory ratings (Yuan & Woodman, 2010; Zhang & Bartol, 2010a, 2010b), peer ratings (e.g., Alge et al., 2006), and expert ratings (e.g., Choi & Chang, 2009). Archival objective data, such as number of patents or number of new products launched, was mainly used to assess innovation at the organizational level (Latham & Braun, 2009; Puranam et al., 2006), where some 36% of all studies in this period utilized this approach.

It is encouraging to note such advances in the methodological sophistication of study design characteristics, and especially to see an apparently notable decline in the use of self-report measures for both independent and dependent variables. However, studies at the individual-level lag behind this trend with many published studies reviewed still relying upon self-generated self-report measures, despite evidence that such designs have inherent shortcomings that lead to common method bias, percept-percept inflation, and construct validity concerns (Hülsheger et al., 2009; Ng & Feldman, 2012; Potočnik & Anderson, 2012). Having noted these methodological characteristics, we move on in the following section to propose key research questions and priory issues for future research in organizational innovation generally.

DIRECTIONS FOR FUTURE RESEARCH

Table 6 proposes a total of 60 specific research questions that future studies should address, again using our four levels of analysis framework (again see http://doiop.com/innocreat). Extending beyond these points, we identify 11focal themes that warrant greater attention by researchers.

Integrate the Idea Generation and Idea Implementation Sub-fields

Akin to two siblings who fell out at a family gathering in their distant past, the sub-fields of idea generation and idea implementation remain doggedly disconnected from one another. Our unambiguous call is for these two disparate sub-fields to become far more integrated in future. Dominant perspectives, patterns of citation of specific literatures, and inferences to future research and practice have unfortunately developed without sufficient synergy and integration. This is especially regrettable given that the phenomena of creativity and innovation have such clear overlaps, similarities, and the potential for synergy to advance our comprehensive understanding of these phenomena in organizations. Despite this, some recent signs of a reunion and reconciliation between these two sub-disciplinary siblings have

appeared and these developments, we believe, are highly beneficial and hold out substantial promise for future research in both sub-domains to become more mutually-informed, integrated, and impactful upon organizations and policy makers (Bledow et al., 2009b). The more that these two sub-domains can be integrated by future research efforts, the better.

Need for Theorizing and Theory-driven Studies

Second, compared with the exciting development of multiple distinctive new theories (e.g., Amabile, 1983; West, 1990; Woodman et al., 1993) at the start of workplace creativity and innovation research we are struck by the relative lack of theoretical advances across the creativity and innovation literatures in the past decade. This holds true at the individual, team, and organizational levels-of-analysis, but is perhaps less so for the more emergent studies having appeared using multi-level approaches. Although a whole morass of valuable empirical studies has appeared over the last decade, relatively few distinctively theoretical advances have been published within this sheer volume of studies. To invert the title of one paper – "*stagnant fountains and sparkling ponds*" (as opposed to "*stagnant ponds and sparkling fountains*": West, 2002a) – characterizes perhaps marginally unkindly our impression of this situation. In overview, there have been relatively few theoretical proposition papers, model development papers, or conceptual development pieces over the recent period in our view. Ironically, with the exception of some of the theoretical contributions we discussed earlier in this paper (Bledow et al., 2009a; Zhou, 2006 and some notable conceptual papers published in the *Academy of Management Review*, such as Dhanarag & Parkhe, 2006; Litchfield, 2008; Mainemelis, 2010; Perry-Smith & Shalley, 2003; Sheremata, 2004; Skilton & Dooley, 2010), there remains a real need for more, and more radical, theory-building contributions. Some of the most influential theories in the field have been around 20-30 years or even longer now (e.g., Amabile, 1983, 1988; West, 1990), and yet more recent theoretical contributions, or for that matter, counterpoint papers critical

of existing theories and models, remain notable only by their absence. For a sub-field whose *raison d'être* is to advance understanding of how new and innovative ideas flourish into implemented and valuable innovations, this is both paradoxical and perplexing.

It is not immediately clear to us why this has been the case. Where might future theoretical contributions be most valuable? And in which ways might theoretically-driven studies add most notably to our understanding? Here, the most valuable avenues we consider will be to proffer (a) models and theoretical propositions to explain cross-level and multi-level innovation such as a multi-level model of creativity by Drazin, Glynn, and Kazanjian, (1999) to explain the effects of variables at different levels of analysis simultaneously on creativity and innovation; (b) proposition papers that set up empirically testable hypotheses based upon interactions between multiple variables (not merely single 'predictor' variables and creativity or innovation as the outcome); (c) theoretical integrations based upon findings from meta-analytical integrations of primary studies; and (d) more radical conceptualizations of creativity and innovation processes and outcomes (e.g., innovation as counter-productive behavior, 'dark side' perspectives, innovation as intellectual property right violation, etc.).

We consider several of these themes in later calls below, but these over-riding directions for theory-building we would highlight as having considerable latent potential to advance understanding in this area.

Organization Culture and Facet-Specific Climates for Creativity and Innovation

Linkages between organization culture and climate have remained rather unexplored in creativity and innovation research. Rousseau (1988) called for greater attention to be given to so-called *'facet-specific climates'*, referring to climate for innovation as a dynamic construct linked to organizational culture more generally. Several more recent reviews of the organization culture literature support this assertion (Jones, Jimmieson & Griffiths, 2005; Sarros, Cooper & Santora, 2008; Sørensen, 2002), yet more needs to be done to explain how

culture and climate act as facilitators or inhibitors of innovation within organizations. Organizational-level research clearly suggests that underlying cultures supportive of innovation act as facilitators of change in specific sectors and organizational settings (e.g., Jaskyte & Dressler, 2005; Khazanchi, Lewis & Boyer, 2007) but what is less clear is how these underlying cultures are manifest as facet-specific climates for innovation.

Innovation Process Research

There has been a quite notable paucity of research exploring the processes inherent in creativity and innovation compared with the plethora of studies evaluating the multitude of so-called antecedent factors to innovation. Indeed, the field appears to have moved away from process research in general despite earlier publications of valuable process models derived from longitudinal, observational studies in real-time within differing organizational settings (e.g., King, 1992; Van de Ven et al., 1989). The precise reasons for this are moot, but our impression is that our understanding of innovation processes at different levels of analysis has not moved forwards significantly in recent years. This is especially the case for cross-level and multi-level innovation attempts where our understanding of these phenomena could be greatly elucidated by more process research. Here, research could also valuably adopt a *'momentum perspective'* to examine the effects of changes in key variables over time and how these impinge upon subsequent innovativeness (see, for instance, Chen et al., 2011). We thus call for re-invigorated attention to process studies using appropriate observational, diary study, real-time case study, and ethnographic research approaches within organizational settings. These in-situ approaches, we believe, are potentially valuable to uncover these processes as they unfold in organizations, rather than an over-reliance upon large-scale questionnaire designs that appear to be predominant in the field presently (see also Montag, Maertz, & Baer, 2012).

Redress Creativity and Innovation Maximization Fallacy

As long ago as 1981, Kimberly coined the term *pro-innovation bias* to describe the presumption that innovation is a desirable characteristic and that positive outcomes will invariably arise from all forms of innovation. While we agree that both creativity and innovation have inherently positive connotations (what management team, worker, or organization would not prefer to describe themselves as such?), we go further to suggest that these literatures in general now suffer from *innovation maximization fallacy*. We propose this concept to describe the implicit, untested, and critically suspect set of presumptions that has grown out of pro-innovation bias remaining unchallenged. Innovation maximization fallacy is that *"all creativity and innovation is good; and the more, the better"*. This fallacy unfortunately remains implicit and rarely even acknowledged across the creativity and innovation literatures. Instead, it is a naïve and untested assumption underlying many studies, pragmatic texts, and even some scholarly volumes. The implicit (il)logical assumption appears to be that (a) if a factor or variable correlates with innovativeness, then (b) a higher level, or increase on that variable will lead to higher levels of sustainable innovation. Yet, creativity and innovation are often experienced as disruptive events, do not always benefit all parties affected, may be initiated in response to distress-related stimuli, and excessive innovation may be counter-productive to other aspects of individual, team, or organizational performance (Anderson & King, 1993).

Of course, the logical extension of innovation maximization at any level-of-analysis would be perverse and dysfunctional: individuals, teams, and organizations continuously changing and re-inventing ever-new ways of working but failing to routinize any innovation or to perform routine tasks and responsibilities at the core of organizational success. Just for the sake of visualization, imagine such an organization based upon maximizing all of the factors correlating with innovation we have reviewed at all levels-of-analysis (if that were possible). Would this be viable and sustainable, let alone lead to successful performance? We

would suggest not. Rather, this would inevitably lead to highly dysfunctional job roles, team working structures, or even entire organizations incapable of handling routine task performance demands and that may be fundamentally unstable and uncompetitive (see also Bledow et al., 2009a). Past research has failed to critically examine the underlying assumptions implicit in innovation maximization fallacy. That one variable or another has been found to correlate with creativity or innovation, does not imply that increases in this variable will necessarily increase innovativeness, or that such increases are always desirable. Instead, the crucial issues here are the context for creativity, the contingencies surrounding innovation, and how innovation processes co-exist with routinized processes within any organization, sub-unit, or individual work role (see also Priem et al., 2012). The latter point, in our view, holds out greatest promise to further research in this area; study designs need to examine relationships in real-time between the performance of routine tasks and creativity and innovation processes at different levels of analysis.

A recent study provides initial empirical evidence that examining consequences of creativity and innovation holds much promise to move the field forward. Specifically, Gong, Zhou, and Chang (2013) investigated how riskiness orientation (i.e., the tendency to make large and risky resource commitments concerning entry into new businesses or markets), realized absorptive capacity (i.e., capabilities to transform and apply new knowledge), and firm size influence the employee creativity -- firm performance relation. They found that employee creativity was negatively related to firm performance when riskiness orientation was high, positive when realized absorptive capacity was high, and more positive in small than large firms.

Taken together, future research is called for to redress the pro-innovation bias but also to debunk the myth that all innovation is good and more creativity and innovation is better for organizational performance (see also Anderson & Costa, 2010). For instance, studies are

called for that explore situations where innovations were implemented but subsequently were abandoned because they were deemed unsuccessful, where innovation attempts have negative but unintended consequences, where individual-level work role innovations may even be seen as counterproductive behavior, where too much innovation may be detracting from more general overall job and team performance, or where the outcomes from alternative interventions to stimulate innovation are compared empirically. All are examples of where studies in this vein countering innovation maximization fallacy would be valuable.

SMT and Intervention Studies

There has been a marked absence of research either into senior management team (SMT) innovation or of studies adopting truly intervention-based designs to examine the causal effects of planned changes upon innovativeness over the period of our review, and in fact historically. Both issues strike us as potentially highly valuable for present and future research as both possess notable prospects for impacting robustly upon organizational practices and the management of innovation processes in workplace settings (Anderson, Herriot, & Hodgkinson, 2001). However, only a handful of studies have examined innovation at the level of the SMT (e.g., Alexiev, Jansen, Van den Bosch, & Volberda, 2010; Smith & Tushman, 2005; West & Anderson, 1992, 1996) amongst the mass of studies examining creativity and innovation at lower levels in the organizational hierarchy. Both the generation of ideas purely at the level of the SMT and the receipt and treatment of ideas by SMTs proposed upwards to them, have received scant attention in the innovation literatures to date despite the crucial position held by senior managers to facilitate or stifle innovation. One literature that we believe could valuably inform such research is the newly-emergent area of cognitive processes and strategic decision making in SMTs (Hodgkinson, 2001).

As regards intervention studies, our comprehensive review failed to locate a single adequately conducted and reported study that employed a genuine intervention design at any

of the levels of analysis considered (although some experiential case studies are written-up in the wider OD literature). Here, we call for fully functional, pre- and post-measurement designs, preferably with the use of experimental and control group designs in real life organizational interventions with the express aim of improving individual-, team-, or organizational-level innovativeness. We foresee such intervention studies at the individual- and team-levels as being the most feasible to conduct, not least to give direct empirical evidence on the efficacy of a range of creativity training techniques that have mushroomed in the consultancy arena (see also Epstein, Schmidt, & Warfel, 2008).

Leadership Style in the Creativity-Innovation Cycle

Our review noted some studies at different levels of analysis that unambiguously confirm the importance of leadership style. However, research in this area was more limited that one might have supposed, especially given the pervasive importance of leadership to innovation outcomes (Bledow, et al., 2009a, 2009b; Chen et al., 2013). Whether at the level of individual supervision, the work group, or higher level strategic leadership within an organization, effective leadership for innovation is paramount. We thus view this topic area as particularly important, but so far rather neglected in empirical studies. Far more could be done to elucidate the effects of leadership style and behavior upon creativity and innovation in the workplace, and in particular effective leadership styles at different stages in the innovation cycle. How do leaders handle the competing demands of routine task management and simultaneously trying to manage innovation processes? Is it really possible for leaders to fundamentally modify their behavior dependent upon stage in the innovation cycle? How can a CEO or board of directors most effectively influence organization strategy and culture to facilitate innovativeness? Again, Table 6 (http://doiop.com/innocreat) sets out more questions in this regard. These, and other vital issues regarding the effects of leadership upon innovation remain largely open for future research to explore and explain.

'Dark Side' Approaches and Studies

An intriguing but to date under-researched issue concerns what has been termed the 'dark side' of innovation predictors, processes and outcomes (Anderson & Gasteiger, 2008a; 2008b; Janssen et al., 2004). Past studies reveal variously that innovation attempts can be provoked by negative work role evaluations and moods (Binnewies & Wörnlein, 2011; Bledow, Rosing, & Frese, 2013), that experienced conflict may provoke innovation, that innovation is perceived in-progress and in-situ as conflictual, and that its outcomes may be both positive and negative in terms of team cohesion and objective clarity (e.g., Chen, Liu, & Tjosvold, 2005). Binnewies and Wörnlein (2011), for instance, use a diary study method to examine the effects of negative affect, job stressors, and perceived job control on the innovativeness of a sample of interior designers. They found that job control moderated the relation between negative affect and daily creativity. This more qualitative approach, we believe, holds promise to open up both the dark sides to innovation attempts and the process as it unfolds over time. As Anderson and Gasteiger (2008b: 422) summarize, "Truly, there is a dysfunctional aspect to innovation, less visible or managerially appealing, but an aspect nevertheless that has surfaced repeatedly across empirical studies". Such dark side research also counters any uncritically assumed positive antecedents and processes of innovation, but this perspective further has the advantage of contributing to our understanding of workplace innovation phenomena 'warts and all'. Future research, we suggest, should therefore attempt to model both the positive and negative sides to innovation, and integrative models should encapsulate these in ways that allow them to be considered in relation to innovation antecedents, processes, and outcomes.

Role of Customers in Employee Creativity and Innovation

Much existing theorizing and research on social contexts for employee creativity and innovation has been confined within organizational boundaries. For example, researchers

have studied how supervisors and coworkers facilitate or inhibit employee creativity and we have reviewed many of such studies. However, with a few exceptions, little attention has been paid to how actors outside of the organization – customers, clients, professional bodies, cross-boundary networks, etc. - influence employee creativity and innovation (see Operti & Carnabuci, in press). This view is consistent with the demand side of the innovation that has been explored in relation to technological innovation (Priem et al., 2012). Yet, our review found a dearth of studies that have examined the causes, processes, or effects of cross-boundary innovation from the outside-in. Future studies could examine these outside-in influences regarding how and why employees engage in creativity and innovation but we see particular promise in relation to customer-driven innovation attempts.

Role of the Internet and Social Media in Creativity and Innovation

Technological advancements, especially the near-ubiquitous penetration of the internet, may have the potential to fundamentally alter how creativity and innovation are fostered and managed by organizations. Indeed, many organizations are already using these technologies to foster idea generation and dissemination but our impression is that management science research has, if anything, lagged behind practice. Given the increasing tendency of geographically dispersed teams, the importance of internet in creativity and innovation management should be examined in much more detail. Compared to traditional face-to face teams such virtual teams are faced with specific challenges, such as time zone dispersion and high member heterogeneity, which most likely pose specific requirements on their innovative attempts (Gajendran & Joshi, 2012). Furthermore, we know little about how other social media (e.g., Facebook, mobile texting, etc.) affect creativity and innovation. Work is also needed to examine the concomitant advantages and disadvantages of open-source innovation, that is, innovation that is co-produced by its users.

Future Research Design Imperatives

In addition to these main avenues of focus for future studies, there are two pressing imperatives regarding research design – the need to meta-analytically integrate the increasing volume of primary studies, and the need to expand the numbers of cross-level and multi-level study designs.

Meta-analyses of Primary Studies. Concurring with calls in past reviews, we still note the need for meta-analytical integration of the innovation research at, and between, different levels of analysis (Anderson & King, 1993; Damanpour, 2010; Rosing, et al., 2011). Although progress has been made through the publication of several recent meta-analyses, particularly at the team level, there is still much room in our view for further quantitative integrations. This is particularly true at the individual level-of-analysis where there is still a lack of meta-analytic integrations of this increasingly large and disparate body of studies. Once such quantitative integrations have been undertaken and published, it will free-up researchers to pursue other research questions, and cross-level issues, rather than to continue to focus upon historically well-examined relationships and at a single level-of-analysis.

Cross-level and Multi-level Approaches and Studies. Table 6 (http://doiop.com/innocreat) sets out several pressing themes and questions for cross-level and multi-level studies. As previously mentioned, we believe that such approaches have considerable promise to move forward our understanding of creativity and innovation in organizations that, by their nature, often involve cross-level and multi-level phenomena. Four relevant interfaces hold out real promise: (i) *The individual-team (I-T) interface* - where individual employee ideas or proposals are taken up by a team and pursued toward implementation; *(ii) The team-individual (T-I) interface* - where work group processes and phenomena impinge upon individual team members; *(iii) The team-organization (T-O) interface* – where team innovations involve wider aspects of the organization or its senior management; and *(iv) The organization-team (O-T) interface* – where organizational-level

processes and phenomena impinge upon teams. All four warrant future research attention and we propose these interfaces also to highlight the bidirectional effects likely to occur between different levels of analysis for different types of innovation phenomena.

CONCLUSION

Without doubt, the range and variety of advances in creativity and innovation research described in this review have significantly advanced our understanding of how these phenomena play out at the various levels-of-analysis within organizations. Our objective in undertaking this review was to present a comprehensive but constructively critical review of the burgeoning literatures that now comprise our multidisciplinary knowledge-base on creativity and innovation in the workplace. The volume of contributions we located and covered, as well as the exponential growth we observed in this literature base, led us to impose our four levels-of-analysis framework as an organizing heuristic. Our impression as we progressed with this literature review was that the field has continued to make strides forwards, but, and these are notable shortcomings, that it has remained afflicted by disparate approaches, some lack of theoretical grounding, and a general paucity of integrative and multi-level studies over recent years. Redressing these limitations would generate a quantum leap forwards in our understanding of the complex phenomena comprising workplace creativity and innovation. Researchers active in this diverse field need to embrace these challenges. Without innovation few organizations can hope to survive and prosper; we believe that precisely the same holds true for research into creativity and innovation research in the future.

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*For additional references cited online in all Tables, again see http://doiop.com/innocreat

APPENDIX

The following should be an online supplement:

Figure 1

Table 1

Table 2

Table 3

Table 4

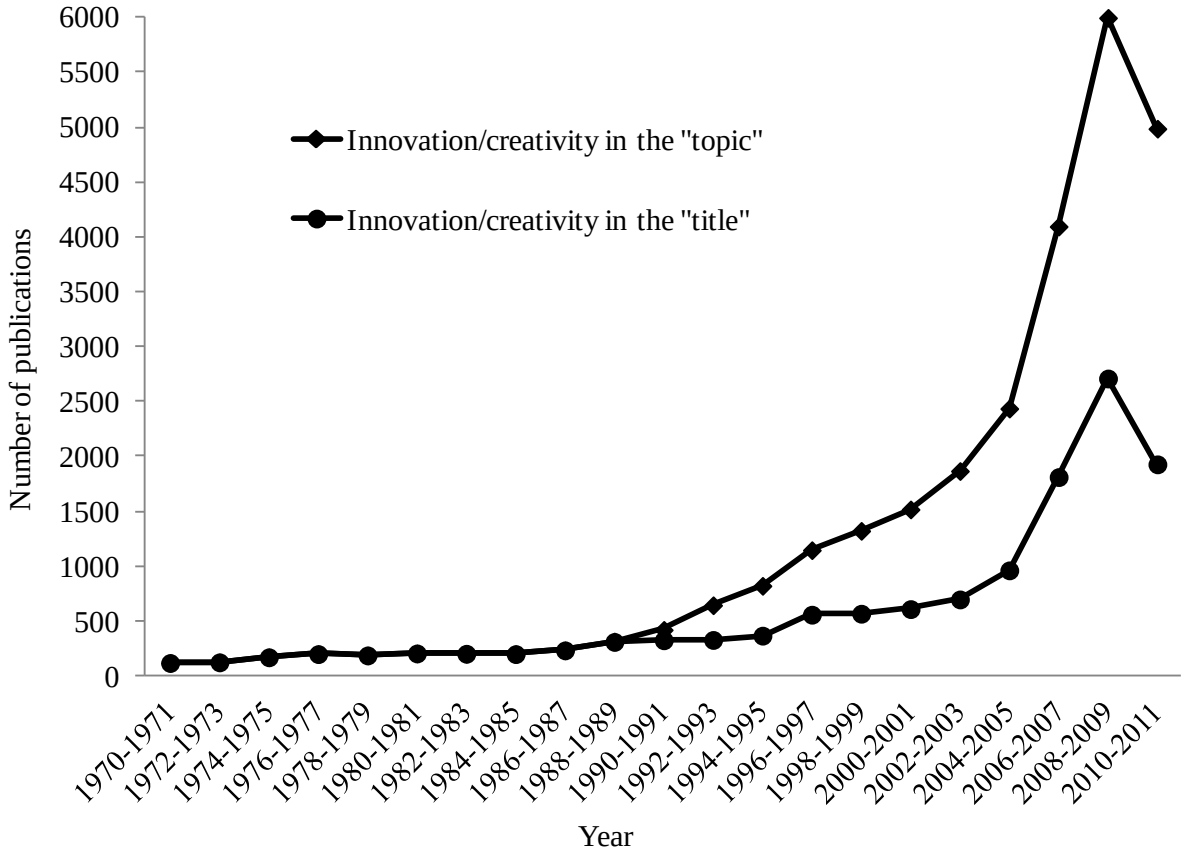
Table 5

Table 6

Additional References

Figure 1

Growth in published papers in the wider field of creativity and innovation[1]



[1]The literature search was conducted in Web of Science using creativity or innovation as keywords in 6 subject fields (Management; Business; Psychology, Multidisciplinary; Psychology, Applied; Social Psychology; and Psychology).

Table 1

Articles on innovation in organizations in top-tier journals: 2002 –2011

Journal	Total number of articles published
Academy of Management Journal	52
Academy of Management Review	8
Administrative Science Quarterly	3
Applied Psychology: An International Review[a]	7
British Journal of Management	6
European Journal of Work & Organizational Psychology	6
Group & Organization Management	5
Human Performance	3
Human Relations	6
Journal of Applied Psychology	24
Journal of Applied Social Psychology	2
Journal of Management	20
Journal of Management Studies	11
Journal of Occupational & Organizational Psychology	13
Journal of Organizational Behavior[b]	39
Journal of Personality And Social Psychology	2
Journal of Vocational Behavior	1
The Leadership Quarterly[c]	27
Management Science	9
Organization Science	18
Organization Studies	5
Organizational Behavior and Human Decision Processes	3
Personnel Psychology	3
Psychological Bulletin	2
Research in Organizational Behavior	1
Research in Personnel and Human Resources Management	1
Scandinavian Journal of Management	2
Scandinavian Journal of Psychology	1
Small Group Research	3

Note: [a] Lead article, four commentaries and a response (Volume 51). [b] two special issues (Volumes 25 and 28). [c] two-part special issue (Volumes 14 and 15)

Table 2

Country of sample origin: Top-tier journal articles on innovation: 2002 – 2011

Country of origin	Number of articles
Australia	4
Belgium	2
Brazil	1
Bulgaria	2
Canada	8
China	13 (+2 HK)
Germany	16
India	2
Israel	13
Italy	1
Japan	1
Korea	6
Norway	2
Slovenia	1
Spain	5
Sweden	2
Taiwan	8
The Netherlands	15
UK	20
USA	76
Samples from different countries within the same study	22
Europe (no specific country clarification)	3

Note: The articles included in this table were published in the journals presented in Table 1

Table 3

Main theoretical frameworks, factors implicated, and example publications

Theory	Level-of-analysis	Factors implicated in creativity/innovation	Example publications
Componential Theory of Organizational Creativity and Innovation (Amabile, 1997)	Individual/Team	Expertise, Creativity skills, Task motivation (intrinsic), Work group support	Choi, Anderson, & Veillette (2009); Hirst, Van Knippenberg, & Zhou (2009a); Jung, Wu, & Chow (2008)
	Organization	Organizational and Supervisory Encouragement, Resources, Challenging work, Freedom, Workload pressure, Organizational impediments	
Interactionist Theory of Organizational Creativity (Woodman et al., 1993)	Individual	Personality, Cognitive abilities/style, Intrinsic motivation, Knowledge	Perry-Smith (2006); Shalley, Gilson, & Blum (2009); Yuan & Woodman (2010)
	Group	Norms, cohesiveness, size, diversity, roles, task, problem-solving strategies	
	Organization	Culture, resources, rewards, strategy, structure, technology	
Theory of Individual Creative Action (Ford, 1996)	Individual	Goals, communication networks, reward systems, resources, tolerance of ambiguity, self-confidence, creative self-image, emotions, expertise, creative abilities	Janssen (2005); Unsworth & Clegg (2010)

(continued)

Table 3 (continued)

Theory	Level-of-analysis	Factors implicated in creativity/innovation	Example publications
Model of Paternalistic Organizational Control and Innovation and Group Creativity (Zhou, 2006)	Team	Paternalistic organizational control, intrinsic motivation, national culture	None
Theory of Team Climate for Innovation (West, 1990)	Team	Vision, Task orientation, Participative safety, Support for innovation	Hülsheger, Anderson, & Salagado (2009); Fay, Borrill, Amir, Haward & West (2006); King, De Chermont, West, Dawson, & Hebl (2007); Pirola-Merlo & Mann (2004)
Ambidexterity theory (Bledow et al., 2009a; 2009b)	Individual	Alternating between different mindsets and action sets based on domain-relevant expertise	Rosing, Frese, & Bausch (2011)
	Team	Maintaining and benefiting from the diversity, while at the same time integrating this diversity toward common goals; Having ambidextrous leader	
	Organization	Separating between exploration and exploitation at the top management level; Implementing organizational values and practices to manage conflicting demands	

Table 4

Summary of creativity and innovation research findings for 2002-2011

Level of analysis	Construct/ variable	Dimension	Effect direction	Example studies
Individual	Individual differences: Personality	Openness to experience	+	Baer (2010); Baer & Oldham (2006); Madjar (2008); Raja & Johns (2010);
		Conscientiousness/ extraversion/ neuroticism/ agreeableness	zero	Miron et al. (2004); Raja & Johns (2010)
		Proactive personality/ creative personality/ creative role identity	+	Farmer et al. (2003); Gong et al. (2012); Madjar et al. (2002); Tierney & Farmer (2011)**;** Wang & Cheng (2010); Wu et al. (in press); Zhou (2003)
	Individual differences: Goal orientation	Learning orientation/ mastery orientation	+	Gong et al. (2009); Janssen & Van Yperen (2004)
		Growth need strength	+	Shalley et al. (2009)
	Individual differences: Values	Conservation value/ congruence of values	+	Choi & Price (2005); Shin & Zhou (2003)
		Conformity value	-	Zhou et al. (2009)
	Individual differences: Thinking styles	Need for cognition	+	Wu et al. (in press)
		Systematic thinking style	-	Clegg et al. (2002)
	Individual differences: Self-concepts	Self-esteem and self-monitoring/ (creative, role-breadth) self-efficacy	+	Axtell et al. (2006); Carmeli & Schaubroeck (2007); Clegg et al. (2002); Rank et al. (2009); Tierney & Farmer (2002, 2004, 2011)
		Regulatory focus: promotion	+	Zhou et al. (2012)
		Regulatory focus: prevention	-	Zhou et al. (2012)

(continued)

Table 4 (continued)

Level of analysis	Construct/ variable	Dimension	Effect direction	Example studies
	Individual differences: Knowledge	Knowledge	+	Howell & Boies (2004); Krause (2004); Obstfeld (2005)
	Individual differences: Abilities	Networking ability/ creative ability	+	Baer (2012); Choi et al. (2009)
	Individual factors: Psychological states	Positive affect/ positive moods/ feelings of energy and vitality	+	Amabile et al. (2005); Atwater & Carmeli (2009); Binnewies & Wörnlein (2011); George & Zhou (2002, 2007); Kark & Carmeli (2009); Madjar et al. (2002); Madrid et al. (in press); Ng & Feldman (2009)
		Negative affect/ negative moods/ emotional ambivalence	mixed	Amabile et al. (2005); Bledow et al. (2013); Binnewies & Wörnlein (2011); Fong (2006); George & Zhou (2002, 2007); Madjar et al. (2002); Ng & Feldman (2009)
	Individual factors: Motivation	Intrinsic motivation/ expected positive performance outcomes	+	Eisenberger & Aselage (2009); Grant & Berry (2011); Mueller & Kamdar (2011); Shin & Zhou (2003); Yuan & Woodman (2010); Zhang & Bartol (2010a)
		Expected image risks	-	Yuan & Woodman (2010)
	Individual factors: Others	Strain/ psychological contract breach	-	Ng et al. (2010); Van Dyne et al. (2002)
		Trust	+	Clegg et al. (2002); Gong et al. (2012)
	Task contexts: Job complexity	Job complexity/ routinization	+	Baer et al. (2003); Farmer et al. (2003); Ohly et al. (2006); Shalley et al. (2009); Tierney & Farmer (2004)
	Task contexts: Goals and job requirements	Job required creativity/ innovativeness	+	Tierney & Farmer (2011); Unsworth & Clegg (2010); Unsworth et al. (2005); Yuan & Woodman (2010)

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Table 4 (continued)

Level of analysis	Construct/ variable	Dimension	Effect direction	Example studies
		Time pressure	mixed	Baer & Oldham (2006); Binnewies & Wörnlein (2011); Ohly et al. (2006); Ohly & Fritz (2010)
		Rewards	+	Baer et al. (2003); Eisenberger & Aselage (2009); George & Zhou (2002)
	Social contexts: Leadership and supervision	Transformational leadership	+	Bono & Judge (2003); Gong et al. (2009); Hirst et al. (2009b); Pietrese et al. (2010); Rank et al. (2009); Shin & Zhou (2003)
		Transactional leadership	-	Pietrese et al. (2010); Rank et al. (2009)
		Supervisory support/ supervisory empowerment behaviors/ supervisory benevolence	+	Janssen (2005); Madjar et al. (2002); Wang & Cheng (2010); Zhang & Bartol (2010a)
		Supervisory expectations for creativity/ supervisory developmental feedback and non-close monitoring	+	Carmeli & Schaubroeck (2007); Tierney & Farmer (2004); Zhou (2003)
		Influence-based leadership	mixed	Krause (2004)
	Social contexts: Coworker influences	Coworker support/ creativity expectations by coworkers	+	Farmer et al. (2003); Madjar et al. (2002)
		Presence of creative coworkers	mixed	Madjar et al. (2011); Zhou (2003)
	Social contexts: Customer influences	Customer input/ customer affect-based trust	+	Madjar & Ortiz-Walters (2008)
	Social context: Other social influences	Feedback	+	De Stobbeleir et al. (2011); George & Zhou (2007); Zhou (2003); Zhou (2008a)

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Table 4 (continued)

Level of analysis	Construct/ variable	Dimension	Effect direction	Example studies
		Evaluation/ justice	mixed	George & Zhou (2007); Khazanchi & Masterson (2011); Yuan & Zhou (2008)
	Social context: Social networks	Social network	mixed	Baer (2010); Obstfeld (2005); Perry-Smith (2006); Perry-Smith & Shalley (2003); Tortoriello & Krackhardt (2010); Zhou et al. (2009)
	Other research	Willingness to take risks/ career commitment/ resources for creativity/ organizational identification/ job involvement/ information privacy	+	Alge et al.(2006); Janssen (2003); Madjar et al. (2011)
		Creative process engagement	mixed	Zhang & Bartol (2010b)
Team	Team structure	Task and goal interdependence/ size	+	Fay et al. (2006); Gilson & Shalley (2004); Tjosvold et al. (2004); Wong et al. (2009; Zhang et al. (2007)
	Team composition	Heterogeneity (diversity)/ cognitive style/ multidisciplinarity	mixed	Chi et al. (2009); Fay et al. (2006); Miron-Spektor et al. (2011); Shin & Zhou (2007); Somech (2006); Somech & Drach-Zahavy (2013); Taylor & Greve (2006)
		Expertise/ experience/ membership change	+	Baer et al. (2010); Taylor & Greve (2006); Vera & Crossan (2005)
	Team climate	Reflective climate	zero	Choi et al. (2011)
		Climate for excellence	+	Eisenbeiss et al. (2008)
		Participative safety/ vision/ support for innovation/ task and goal orientation/ conflict	mixed	Chen et al. (2005); De Dreu (2006); Eisenbeiss et al. (2008); Farh et al. (2010); Fay et al. (2006); Gilson & Shalley (2004); Jansen et al. (2008); Jehn et al. (2010); Pearce & Ensley (2004); Zhang et al. (2007)
	Team processes	Information exchange/ problem solving style/ team participation	+	Baer et al. (2010); De Dreu (2006); Gilson & Shalley (2004); West et al. (2003)

(continued)

Table 4 (continued)

Level of analysis	Construct/ variable	Dimension	Effect direction	Example studies
		Conflict management/ knowledge creation/ improvisation/ minority dissent	mixed	Chen et al. (2005); De Dreu (2002); Schulze & Hoegl (2006); Vera & Crossan (2005)
		Reflexivity	+	De Dreu (2002); Somech (2006); Fay et al. (2006); Schippers et al. (in press); Tjosvold et al. (2004)
	Team leadership	Transformational and transactional leadership	mixed	Eisenbeiss et al. (2008); Jansen et al. (2008); Kahai et al. (2003); Rosing et al. (2011)
		Participative leadership/ leader behaviors/ unconventional leadership	+	Amabile et al. (2004); Jaussi & Dionne (2003); Somech (2006)
		Directive leadership	zero	Somech (2006)
Organi-zational	Management-related factors	HR practices/ top managers' demographic characteristics (e.g., ownership, racial and gender diversity)	mixed	Beugelsdijk (2008); Damanpour & Schneider (2006); Latham & Braun (2009); Martinez-Sanchez et al. (2009, 2011); Richard et al. (2004); Shipton et al. (2006); Vogus & Welbourne (2003); Yang & Konrad (2011); Wu et al. (2005)
		Transformational and transactional leadership/management support/top management leadership/ cooperative conflict management	+	Choi & Chang (2009); Damanpour & Schneider (2006); Elenkov & Manev (2005); Jung et al. (2003, 2008); Tjosvold et al. (2010)
	Knowledge utilization and networks	Knowledge search and spillover (transfer)/ knowledge stock/ social network	mixed	Belenzon & Berkovitz (2010); Katila & Ahuja (2002); Kijkuit & Van den Ende (2010); Kyriakopoulos & De Ruyter (2004); Operti & Carnabuci (in press); Perretti & Negro (2007); Phelps (2010); Van Wijk et al. (2008); Yang et al. (2010)
		Absorptive capacity/ intellectual capital	+	Lichtenthaler (2009); Rothaermel & Hess (2007); Subramaniam & Youndt (2005)

(continued)

Table 4 (continued)

Level of analysis	Construct/ variable	Dimension	Effect direction	Example studies
	Structure	Complexity/ regulative, normative, and cultural-cognitive institutional forces/ harmonization/ decentralization/ reorganization	+	Cohendet & Simon (2007); Damanpour & Schneider (2006); Jung et al. (2008); Karim (2009); Shipton et al. (2006); Vermeulen et al. (2007)
		Formalization/ structural integration	-	Jung et al. (2008); Puranam et al. (2006)
	Strategy	Organization strategy/ innovation strategy	+	He & Wong (2004); Richard et al. (2003); Un & Cuervo-Cazurra (2004)
	Size	Number of employees/ sales/market share/total assets	+	Camison-Zornoza et al. (2004); Damanpour (2010); Damanpour & Schneider (2006)
	Resources	Availability of resources	zero	Choi & Chang (2009)
		Resource diversity and quality/ resource exchange	+	Hargadon & Bechky (2006); Srivastava & Gnyawali (2011); Wong et al. (2007)
		Slack resources	mixed	Greve (2003); Latham & Braun (2009)
	Culture and Climate	Innovation climate/ reflexivity climate/ climate for psychological safety and personal initiative	+	Baer & Frese (2003); Jung et al. (2003, 2008); Patterson et al. (2005)
		National culture (power distance, masculinity, uncertainty avoidance, individualism, social face)/ empowerment	mixed	Elenkov & Manev (2005); Jung et al. (2003); Wong et al. (2007)
	External environment	Competition	+	Bengtsson & Sölvell (2004); Damanpour (2010); Jung et al. (2008)
		Geographic distribution of R&D activity/ environmental uncertainty/ turbulence/ dynamism/ urbanization/ community wealth/ population growth/ unemployment rate	mixed	Damanpour & Schneider (2006); Jung et al. (2008); Lahiri (2010); Martinez-Sanchez et al. (2011); Wu et al. (2005)

(continued)

Table 4 (continued)

Level of analysis	Construct/ variable	Dimension	Effect direction	Example studies
	Innovation diffusion	Diffusion process	mixed	Boland et al. (2007); Ferlie et al. (2005); Roberts & Amit (2003); Weigelt & Sarkar (2009)
	Corporate entrepreneurship as innovation	HR practices/ environmental perceptions and discretionary slack	mixed	Kaya (2006); Schmelter et al. (2010); Simsek et al. (2007); Zhang & Jia (2010)
		Decision comprehensiveness/ transformational leadership	+	Heavey et al. (2009); Ling et al. (2008)
Multi-level	Team structure	Task and goal interdependence	mixed	Van der Vegt & Janssen (2003)
		Bureaucratic practices	-	Hirst et al. (2011)
	Team climate and processes	Team climate	mixed	Černe et al. (in press); Pirola-Merlo & Mann (2004); Chen et al. (2013)
		Team learning	+	Hirst et al. (2009a)
	Team composition	Heterogeneity/ diversity	mixed	Shin et al. (2012); Van der Vegt & Janssen (2003)
		Identity comprehension	+	Thatcher & Greer (2008)
	Leadership	Transformational leadership		Shin et al. (2012); Wang & Rode (2010); Chen et al. (2013)
		LMX	+	Gajendran & Joshi (2012); Liao et al. (2010)

Note: Adapted, extended, and fully updated from Anderson et al. (2004). Effect directions *(+, -, mixed, or zero*) summarized on the basis of the balance of all studies published on each variable. For instance, openness to experience has been generally found to be positively associated with individual innovativeness. Only example studies are quoted in the final column and hence this does not represent an exhaustive list of all published papers for each variable. Some variables have been examined either as independent variables, moderators, or mediators. For several variables, at all levels-of-analysis, curvilinear relationships (n-shaped and u-shaped) have been observed in a few studies (e.g., time pressure at the individual level, minority dissent at the group level, knowledge search at the organizational level) but for the sake of brevity effect directions are summarized as the overall balance or trend of findings.

Table 5

Summary of the measurement methods used at different levels of analysis

Level-of-Analysis	Measurement method	*N*	%	Total papers
Individual level	Self-report	17	23.6	72
	Supervisory ratings	35	48.6	
	Peer ratings	7	9.72	
	Behavior count/expert ratings	1	1.39	
	Archival data	3	4.17	
	Qualitative analysis	2	2.78	
	Mixed[a]	6	8.33	
	Meta-analysis	1	1.39	
Team level	Self-report	2	7.14	28
	Supervisory ratings	17	60.7	
	Behavior count/expert ratings	2	7.14	
	Mixed[b]	5	17.9	
	Meta-analysis	2	7.14	
Organizational level	CEO/presidents/managers[f]	13	23.6	55
	Behavior count/expert ratings	3	5.45	
	External observers[e]	2	3.64	
	Archival data	20	36.4	
	Qualitative analysis	8	14.5	
	Mixed[c]	6	10.9	
	Meta-analysis	3	5.45	
Multi-level	Self-report	2	14.3	14
	Supervisory ratings	8	57.1	
	Archival data	2	14.3	
	Mixed[d]	2	14.3	

Note: A total of 165 empirical articles included in this table were published in the journals outlined in Table 1.[a] peers and expert coders, peers and self-reports, customers and supervisors, self-reports and experts, self-reports, supervisors and archival data; [b] team members and leaders, self-reports, leaders and internal customers, team members and external; [c] employees and experts, archival data and managers; [d] peers and expert raters; team members and team leaders; [e] representatives from customer organizations; [f] 7 studies used only one source of information at the organizational level.

Table 6: Themes for Future Research: Topics and Key Questions

Level-of-Analysis	Imperative Topics and Critical Research Questions
Individual	Meta-analyses of individual level characteristics
	1. Which knowledge, skills, abilities and other factors (KSAOs) impinge upon work role creativity and innovation?
	2. How do different KSAOs interact and contribute to overall variance in innovative job performance?
	3. How can innovative job performance be measured with validity and reliability, and also integrated into routine appraisal ratings?
	4. Personality dimensions and innovative job performance – what are the correlates of Five Factor Model dimensions, lower order dimensions, and composite dimensions?
	Relative variance accounted for by different individual characteristics
	5. How do different personality characteristics predict innovative job performance?
	6. How do personality, motivation, cognitive ability and other individual characteristics interact to predict innovativeness?
	7. Is it possible to select for innovative job performance with reliability and validity?
	Processes of creativity and work role innovation
	8. How do different characteristics influence different phases in the innovation process – idea generation versus idea implementation
	9 .To what extent are creativity and innovation training interventions efficacious?
	10. Innovative behavior or counter-productive behavior – how is idea generation perceived?
	Effects of innovation attempts upon individual workers/supervisors/colleagues
	11. Do supervisors and managers really reward innovation attempts with better performance ratings?
	12. To what degree do individuals experience innovation as being a stressful activity?
	13. What are the effects upon psychological well-being for individuals who either ‘fail’ to be innovative or ‘fail’ in their attempted innovations?
	14. How do co-workers and colleagues perceive individuals who actively engage in radical innovation attempts?
	15. Career stage and innovation – is it more advisable to engage in incremental innovation during early career and only attempt radical innovation in later career, once established?

(continued)

Table 6 (continued)

Level-of-Analysis	Imperative Topics and Critical Research Questions
	Innovation as an independent variable
	16. Effects of innovation attempts – both successful and failed – upon individual well-being, job satisfaction, intention to quit, etc.?
	17. Coping strategies for attempting to deal with so-called 'imposed innovations'?
	18. Past experiences of innovation and their effects upon future innovation attempts?
	Motivation and rewards
	19. Relative effects of intrinsic versus extrinsic motivation, for instance in employee suggestion schemes?
	20. Intellectual property rights and the exploitation of value by organizations from high-value product innovations?
	Job characteristics and job design
	21. How can job design best handle the competing demands of routine job performance and innovative job performance?
	22. Slack versus distress-related innovation – under which condition do individuals innovate most effectively, and in what circumstances?
Team	Post- meta-analytical directions and outstanding research questions and directions
	23. Climate and leadership style are important, why continue to replicate these robust meta-analytic findings with replication-extension primary studies?
	24. Rather, how do team-level factors (e.g., climate, leadership style, composition) interact at different phases in the innovation cycle?
	25. How can leaders influence and generate team climates facilitative of innovation?
	Group processes and innovation management
	26. How do team processes influence innovation at different stages (e.g., participation, minority dissent, conflict, etc.)
	27. To what extent to team process determine climate that in turn influences innovation?
	28. How can teams manage the conflicting demands of routine task performance and innovation simultaneously?
	29. How can team leaders select-in the most appropriate mix of team members to facilitate innovation?

(continued)

Table 6 (continued)

Level-of-Analysis	Imperative Topics and Critical Research Questions
	Leadership style
	30. Is it possible for team leaders to effectively manage routine tasks, idea generation, and idea implementation simultaneously?
	31. How do leaders cope with ambidextrous demands – opening up behaviors during idea generation, closing down behaviors during implementation?
	32. Can innovation management be shared between more than one leader at different stages in the innovation cycle?
	Innovation as an independent variable
	33. Team recuperation and recovery after radical innovation – how, when, and to what degree?
	34. How can teams best cope with multiple innovation processes all at different stages of development?
	35. Through which mechanisms can team leaders most effectively 'switch' between the competing task demands of routine task management and innovation process management?
	36. How can teams respond to imposed changes from above by reactive innovation?
	Inter-team research issues
	37. Where innovations cross more than one team, how to inter-group processes affect their development?
	38. Hand-over effects – where one team develops an innovation early on and then has to hand it over to another team for implementation, what processes come into play at this point?
	39. Inter-team synergy – how can organizations effectively use inter-group dynamics and processes to their advantage in innovation process management?
Organizational	Reciprocal relationships
	40. Is there a reciprocal relationship between organizational innovation and firm performance?
	41. Which direction of relationship influences most – innovation to performance, or performance to innovation?

(continued)

Table 6 (continued)

Level-of-Analysis	Imperative Topics and Critical Research Questions
	The role of CEO's in organizational innovation
	42. Which CEO's leadership style facilitates organizational innovation the most?
	43. What mechanisms transmit the effect of CEO's leadership style in innovation?
	44. Are there any cross-cultural differences in the relationship between CEO leadership style and organizational innovation?
	Resources
	45. Which resources enhance organizational innovation the most?
	46. What is the relationship between organizational resources and different types of organizational innovation (e.g., radical-incremental, product-process innovation)?
	External environment
	47. How does economic uncertainty (e.g., credit crunch) influence organizational innovation?
	48. Under what conditions does market competition enhance or foster organizational innovation?
	Industry
	49. Are there any differences in organizational innovation across different industrial sectors?
Multi-level studies	Individual - Team issues: The I-T interface
	50. How can individuals most effectively interact with their proximal work group when proposing new ideas?
	51. In which ways do individual KSAOs, status, and reputation interact with idea proposal reception by work groups?
	52. What processes and tactics best support idea proposal by individuals to their proximal work teams?
	Team – Individual issues: The T-I interface
	53. To what degree can group processes be effectively used to ensure individual compliance to favored innovation options?
	54. What are the psychological and mental health impacts upon the individual of radical work group innovations?
	55. Exclusion and social isolation effects – may these be a concern where one individual opposes team level innovation attempts?

(continued)

Table 6 (continued)

Level-of-Analysis	Imperative Topics and Critical Research Questions
	Team – Organization issues: The T-O interface
	56. How can teams most effectively propose and pursue innovation within their wider organizational environment?
	57. What factors influence the T-O interface most – organizational structure, culture, procedures, rules and regulations, etc.?
	Organization – Team issues: The O-T interface
	58. How do organizational-level factors influence team-level innovation – structure, culture, leadership style, etc.?
	59. To what degree, and in what ways, do teams innovate in response to organization change imposed from above?
	60. How can organizations utilize team structuring and re-structuring (i.e. OD interventions) to facilitate creativity and innovation?

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